

ART. VI.—*On Some Australian Tertiary Pleurotomariæ.*

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(With Plates XIII., XIV.).

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I.—*Pleurotomaria tertiaria*, McCoy. (Pl. XIV., Figs. 1-4).

The first species of the genus *Pleurotomaria* described from Australian Tertiary deposits is that dealt with by the late Sir F. McCoy, under the name of *P. tertiaria*,¹ in 1876, and is indicated as, "Rare, in a hard, pink and yellowish limestone, like lithographic stone, on the east bank of the Moorabool River, near Maude." This species still remains a rare form, and only imperfect specimens are usually obtained. The range of the species may, however, be extended much further down the valley than the locality indicated by McCoy, the section in soft polyzoal and other limestones below the old Clyde Mill, and on the opposite side of the river to the State School, having yielded fair specimens. These deposits along the valley were originally referred to by McCoy as Miocene,² and consequently the Geological Survey mapped them as such.³ This was subsequently followed by Dr. H. Woodward in his paper on Recent and Fossil *Pleurotomariæ*,⁴ and by later writers. This horizon has been referred to as the Upper Maude Beds,⁵ and is probably Eocene, the palaeontological evidence clearly requiring a greater antiquity than Miocene.⁶

1 Prodrômus of the Palæontology of Victoria, Decade III., pp. 23, 24, pl. xxv., figs. 1, 1a, 1b, 1876.

2 Intercol. Exhib. Essays, 1866-67, No. 7. Recent Zool. and Palæontology of Vic., pp. 16-19. Also Selwyn, *Id.*, No. 3, Phys. Geog., Geol., and Min. of Vic., pp. 22, 23. Also Prod. Pal. Vic., Dec. III., p. 23.

3 Geological Survey Quarter-sheet, No. 19, S.W., Wilkinson and Murray, 1865.

4 Geol. Mag., n.s., Dec. III., vol. ii., No. 10, Oct., 1885, p. 434.

5 Proc. Roy. Soc. Vic., vol. vii., n.s., pp. 184, 185, 1895.

6 A.A.A.S., Adelaide, 1893, vol. v., pp. 338-343. Proc. Roy. Soc. Vic., vol. vii., n.s., pp. 186-188. Trans. Roy. Soc. S.A., vol. xix., pt. i., p. 121, 1895. A.A.A.S., Brisbane, 1895 vol. vi., pp. 348-361.

McCoy apparently had this species under a different name in manuscript prior to his description of the species, for in the Exhibition Essays, 1866-67,¹ he remarks, "Amongst the singular forms in these Australian tertiary beds recalling oolitic European ones is a *Pleurotomaria* (*P. Australis*, McCoy), as large as the mesozoic *Pleurotomaria Anglica*."

The description given by McCoy of the type of this species is as follows:—"Shell large, trochiform, apical angle 67°; whorls flat, or very slightly convex; base moderately convex, with (?) a small umbilicus; band of moderate width in the middle of each whorl, slightly depressed. Surface with sub-equal prominent thread-like spiral striae, rather less than their thickness apart (about 10 or 11 above, and the same number below the band), about 3 slightly smaller on the band, reticulated by arched striae, narrower, but nearly as prominent as the spiral striae, and slightly further apart. Length about 2 inches 9 lines; proportional width, $\frac{9.5}{100}$; length of last whorl, $\frac{33}{100}$."

An examination of the type and only specimen of the species possessed by the National Museum, Melbourne, shows it to be only poorly preserved, and considerably chipped in the removal of the matrix; and unfortunately McCoy saw fit to figure a restoration and not the actual specimen, with the result that the figure is inaccurate in several details, and the enlargement of the sculpture is very misleading.

The figures then not being exact, and the description being very brief and too general, new species might very easily have been made out, but for the type being accessible.

A well-preserved specimen, but unfortunately somewhat broken about the apex and aperture, has been very kindly lent to me by the Rev. A. W. Cresswell, M.A., and proves to represent *P. tertiaria*, McCoy; the exact locality from which it was obtained has been forgotten, but judging by the calcareous sandy clay matrix, and since it was thought to come from the Geelong District, there is very little doubt but that the specimen was obtained either from the lower portion of the Moorabool Valley or perhaps from Corio Bay.

¹ Essay, No. 7, Rec. Zool. and Pal. of Vic., p. 18.

Through the kindness of Mr. J. A. Kershaw, Curator of the National Museum, Melbourne, and Mr. F. Chapman, Palaeontologist, I have been able to compare this specimen with McCoy's type, and they agree with me that there is no doubt about their specific identity. The preservation of the shelly material of Mr. Cresswell's specimen is far better than that usually met with in the limestones, casts and impressions being the most frequently obtained under those conditions, consequently the sculpture can be very distinctly and critically examined, and as there are several points of difference from McCoy's figures and description, it might be well to refer to them. The apical angle is practically the same, being only a degree or two less, the whorls are slightly convex above the band, depressed at the band, flat or slightly concave below the band, earlier whorls rather flatter than later; the base is convex becoming depressed towards the periphery, it is faintly spirally and radially striate, the latter marking being somewhat sigmoid, the base is *not* umbilicate, but the columella is strong and twisted; aperture quadrate; the band is about 1.5 mm. wide on a whorl of 14 mm. width; strong spiral threads irregular in width occur on the earlier whorls, but gradually fade out till they become mere striations, there is usually one less above the band than below it and they increase in number as the whorls increase; the arched striae crossing the spiral threads are strongest near the posterior suture and their general trend is at a much more acute angle to the band than the much fainter striae below the band; the earlier whorls from this sculpture show quite a tessellation, but this disappears before the body whorl is reached. McCoy's enlargement of the sculpture shows 12 threads above the band and 12 below, but the type does not show this, there being actually fewer, and also a difference of one above and below the band, nor is the tessellation as regular as figured, while the arched striae in figure 1 are entirely erroneous.

II.—*Pleurotomaria bassi*, sp. nov. (Pl. XIII., Figs. 1, 2).

Recently I obtained a very large specimen of this genus from the Eocene beds of Table Cape, Tasmania, and though not very perfect, through weathering of portion of one side, there appears sufficient character to distinguish it as a new species.

Description.—Shell very large, trochiform, apical angle about 75 degrees, rather lacking in solidity considering its size. Whorls slightly convex, with a well impressed suture, earlier whorls rather flat, impressed suture less marked; whorls rapidly increasing in size, and numbering about nine. The median band is broad, being in width about one-sixth the height of the whorl, it is very strongly marked, and is situated a little below the middle of each whorl. Body-whorl strongly keeled at the base; base very slightly convex to a well-marked umbilicus, which penetrates only to the penultimate whorl; aperture subquadrate, posterior portion of the lip thin, lower edge of the lip slightly thickened and rounded off, becoming thicker and more solid towards the columella, the latter being strikingly more solid and robust than the rest of the shell.

There is evidence of faint spiral striae, irregular in strength, on the upper or posterior portion of the penultimate and body-whorls, and a faint spiral striation is discernible on the base, becoming a little clearer and closer towards the umbilicus; the general character of the surface-marking being a rude and irregular striation in conformity with the lines of growth, the base also showing a strong irregular undulation parallel to the growth.

Dimensions.—Basal diameter, $5\frac{3}{8}$ inches, or 136 mm.; height from the base, $4\frac{1}{8}$ inches, or 103 mm.; breadth of aperture, 3 inches or 75 mm.; depth of aperture, about $1\frac{1}{2}$ inches, or 36 mm.; width of fasciole, near slit, 6 mm. to 5 mm. further back on the body-whorl; length of slit, 48 mm.

Locality.—Basal horizon of the Table Cape Beds, Tasmania, in coarse ferruginous grits. Jan Jukian (Eocene).

Observations.—The large size of this species is worth special note as it compares very favourably with the largest of the specimens yet obtained of *P. adansoniana*, Crosse and Fischer, the best known of the recent species. The thinness of the shell is rather remarkable, especially in view of the coarse gritty material in which it is preserved, and in this respect it is scarcely as thick as the much smaller species of McCoy, in addition to this feature it differs from *P. tertiaria*, in its greater apical angle, the more impressed sutures, in its umbilicus, and in its inornate character. The shortness of the slit, and the

remarkable breadth of the fasciole, and lack of sculpture, are features worthy of special attention in this new species.

III.—*Pleurotomaria*, n.sp.

A new species of *Pleurotomaria* was recorded by the late Professor R. Tate in his list of the Eocene fossils from Cape Otway,¹ and this is subsequently included in M. Vincent's list of Eocene species of this genus,² but I am unaware of any published remarks, description, or figure of this form, and not having seen the specimen, I am unable to give any further information concerning it.

Very imperfect specimens of a high spired form of this genus have been obtained from the Eocene limestones of Waurn Ponds, near Geelong, by Mr. T. S. Hall and myself, but the material yet to hand is too meagre to permit of specific determination.

Our Tertiary representation of this genus appears to be exceptionally good when compared with that of other countries, but before noting the other Tertiary records, there are some points of relationship and classification upon which I would like to comment.

Fischer has divided the recent species into two sections, *Perotrochus*, typified by *P. quoyana*, Fischer and Bernardi, and *Entemnotrochus*, typified by *P. adansoniana*, Crosse and Fischer.

Perotrochus has been defined as:—Form conical, base not umbilicate, whorls striate or granulate, anal fasciole sub-median or below the middle, slit short.

While *Entemnotrochus* is characterised as follows:—Shell conoidal, striate, umbilicate; anal fasciole a little above the middle of the upper surface of the last whorl, slit long, but not exceeding the half of a whorl.

McCoy remarks of *P. tertiaria*³ that it "is almost intermediate in character between the two living ones," the two referred to being *P. quoyana*, and *P. adansoniana*.

1 Trans. Roy. Soc. South Australia, vol. xix., pt. i., p. 112, 1895.

2 Soc. Roy. Malac. de Belg., vol. xxxi., 1896, but not distributed till 24th December, 1899, p. 56.

3 Prod. Pal. Vic., Dec. iii., p. 23.

P. bassi shows some affinity with *P. beyrichi*, Hilgendorf, in that the fasciole is broad, and is situated a little below the middle of the body-whorl, and the slit is short, in these and other respects it appears to agree with Fischer's section *Perotrochus*, but it is distinctly umbilicate. Thus if relationship with the recent forms be pushed, *P. bassi* would also appear to be an intermediate form, and this taken with the *P. tertiaria* characters, would tend to invalidate Fischer's divisions of the recent forms. On the other hand much closer relationship can be made out with Jurassic and Cretaceous forms for both our fossil species, and this is in direct accord with the position of most other Eocene species in other parts of the world, and may perhaps be taken as a small additional piece of evidence in favour of the Eocene age of the deposits containing them.

P. tertiaria McCoy may probably belong to *Leptomaria*, but *P. bassi* certainly does not, and shows rather more affinity with Jurassic forms.

Special interest attaches to this genus as a "persistent type," and on account of its rarity living at the present time, and fossil in Tertiary deposits, as compared with its numerous fossil representatives from older geological deposits ranging up from Silurian.

There are five recent species of which there are only about twenty-three or twenty-four specimens known.

1856. *Pleurotomaria quoyana*, Fischer and Bernardi.

1861. *Pleurotomaria adansoniana*, Crosse and Fischer.

1877. *Pleurotomaria beyrichi*, Hilgendorf.

1879. *Pleurotomaria rumphii*, Schepman.

1899. *Pleurotomaria salmiana*, Rolle.

Including the present new species, *P. bassi*, the number of Tertiary species recorded is twenty, but one at least of these is unknown by any figure or description and ought hardly to be taken into consideration. The remaining nineteen are all very rare, and the majority are recorded from Eocene beds. Altering the age ascribed to *P. tertiaria*, McCoy, from Miocene to Eocene, the species are distributed as follows:—

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|-------------|---|---|-------------|
| Eocene | - | - | 14 species. |
| Miocene | - | - | 2 species. |
| Pleistocene | - | - | 3 species. |

LIST OF THE TERTIARY SPECIES OF PLEUROTOMARIA.

Eocene.

1853. *Pleurotomaria bianconii*, d'Archiac, India.
 1864. *Pleurotomaria concava*, Deshayes, Paris Basin.
Pleurotomaria duboisii, Mayer, Crimea = *Trochus giganteus*, Dubois, non Sowerby.
Pleurotomaria genyi, Mayer, Nice.
 1866. *Pleurotomaria kadin-kewiensis*, d'Archiac, Asia Minor.
Pleurotomaria lamarckii, Mayer, Switzerland.
Pleurotomaria nicaeensis, Bayan, Nice.
 1854. *Pleurotomaria nixus*, Tuomey (*Trochus*), North Carolina.
 1865. *Pleurotomaria perlata*, Conrad, New Jersey.
 1896. *Pleurotomaria* (*Leptomaria*) *whitfieldi*, Vincent, New Jersey = *gigantea*, Whitfield, non Sowerby.
 1892. *Pleurotomaria* (*Leptomaria*) *pergranulosa*, Whitfield, New Jersey.
 1896. *Pleurotomaria* (*Leptomaria*) *landinensis*, Vincent, Belgium.
 1876. *Pleurotomaria tertiaria*, McCoy, Moorabool Valley, Victoria.
 1903. *Pleurotomaria bassi*, Pritchard, Table Cape, Tasmania.

Miocene.

Pleurotomaria sismondai, Goldfuss, Bunde.

1892. *Pleurotomaria atlantica*, Cotter, Santa Maria, Azores.

Pleistocene.

Pleurotomaria fischeri, Mayer MS., Guadaloupe.

1869. *Pleurotomaria duchassaingii*, Schramm, Guadaloupe.

1821. *Pleurotomaria gigas*, Borson, Italy.

Regarding *P. fischeri*, Mayer, M. Crosse in 1882 refers to it as a MS. name.¹ And later again in Bouvier and Fischer's fuller account of the *Pleurotomarias* in 1899,² it is still referred to as an MS. name. Subsequent to 1899 I have found no reference to a description of this species.

¹ Jour. d. Conch., Mon. *Pleurotomaria*, 1882.

² Jour. d. Conch., vol. xlvii., pp. 77-151, 1899.

Dall says of *P. perlata*, Conrad, that it is an ill-defined species, and apparently scarcely recognisable.¹ Bouvier and Fischer in the monograph referred to also refer *P. gigas*, Borson, and *P. atlantica*, Cotter, both to the recent section *Entemnotrochus*, and are inclined to the opinion that these two species are identical.

Concerning *P. sismondai*, Goldfuss, Crosse and Fischer state² that the exact locality of the shell appears doubtful, it is given as the Upper Marine Sands of the neighbourhood of Bunde.

In the description of *P. bianconii*, d'Archiac, the author queries his generic location of this species in the text, but not on his plate.

P. duboisii, Mayer, was first described as *Trochus giganteus*. Dubois, and as that specific name was preoccupied, it was named after Dubois by Mayer.

P. whitfieldi, Vincent, has also been treated in a similar way by Vincent, for this species was first described as *P. gigantea*, Whitfield; this name, as in the previous case, being preoccupied by Sowerby for a Lower Greensand fossil, a change was necessary.

Our total information then on these Tertiary species appears to be of a somewhat meagre order, and if it is accepted that one of the American species is not recognisable, that *P. atlantica* and *P. gigas* are identical, and that *P. fischeri* is only a MS. name, our total number dwindles to sixteen, and the amount of readily-available information on several of these is so slight, that further details concerning them and their occurrence would be very acceptable.

Of forms older than Tertiary, about twelve hundred species are known, and these are about equally divided between the Palaeozoic and Mesozoic, but the Jurassic undoubtedly holds the maximum with about four hundred species.

I wish to express my thanks to Professor W. Baldwin Spencer, Director of the National Museum, for allowing me to refigure the type of *P. tertiaria*, and to Mr. F. Chapman for kindly photographing it.

¹ Trans. Wag. Inst., Philad., vol. iii., pt. 2, p. 423, 1892.

² Jour. d. Conch., vol. ix., p. 162, 1861.



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D. W. Paterson, Photo.

AUSTRALIAN TERTIARY PLEUROTOMARIAS.